THE *Rendiconti* of the *Reale Istituto Lombardo di Scienze e Lettere* for February and March, 1883, contains papers by G. Ascoli, on Irish glosses, especially those of the Ambrosian Codex; by M. E. E. Beltrami, on the theory of magnetic layers; by Z. Volta, on an unpublished drama of Luigi Ceretti; by G. A. Maggi, on the transmission of undulatory motion, and especially of luminous waves, from one isotropic medium to another; by P. F. Denza, on the observations of the transit of Venus made at the observatory of the Collegio Carlo Alberto in Moncalieri.

## SOCIETIES AND ACADEMIES

### LONDON

**Royal Society**, April 12.—"The principal cause of the large errors at present existing between the positions of the Moon, deduced from Hansen's Tables and observation; and the cause of an apparent increase in the secular acceleration in the Moon's mean motion required by Hansen's Tables, or of an apparent change in the time of the Earth's rotation," by E. J. Stone, F.R.S.

The errors in the lunar theory have been traced to the effects of changes in the *unit of time* which have, apparently unconsciously, been introduced, from time to time, into astronomy with changes in the adopted data.

The argument is clearly seen by a consideration of the different expressions for the longitudes of, what may be called, the mean sun which have been adopted for the determination of the sidereal times at mean noon.

If $B$, $H$, and $V$ denote the longitudes of the mean sun according to Bessel, Hansen, and Le Verrier, we have for 1850, January 1, Paris mean noon, $+\ t$

$$\begin{aligned} B &= 280^{\circ}\ 46'\ 36''{\cdot}12 + 1296027{\cdot}618184t + 0{\cdot}0001221805\,.\,t^2 \\ H &= 280\ 46\ 43{\cdot}20 + 1296027{\cdot}674055t + 0{\cdot}0001106850\,.\,t^2 \\ V &= 280\ 46\ 43{\cdot}51 + 1296027{\cdot}678400t + 0{\cdot}0001107300\,.\,t^2. \end{aligned}$$

In all these expressions the unit of time has been *supposed* to be a Julian year of 365·25 mean solar days. The constant differences 7″·08 and 7″·39 in $B-H$ and $B-V$ are not unimportant, for they introduce abrupt changes in the record of time; but the differences in the coefficients of $t$ and $t^2$ show that the *same* unit of time cannot have been adopted in these expressions. The measure of time must be continuous; let, therefore, 1 and $(1+x)$ be the units in $B$ and $H$,

$$\begin{aligned} \text{then } & 1296027{\cdot}618184\,.\,t + 0{\cdot}0001221805t^2 \\ & = 1296027{\cdot}674055t(1+x) + 0{\cdot}0001106850t^2(1+x)^2. \end{aligned}$$

If, therefore, $n = 1296027{\cdot}674055$

$$x = -\frac{0{\cdot}055871}{n} + \frac{0{\cdot}000114955\,.\,t}{n}$$

To reconcile $B$ and $H$, therefore, $x$ must contain a variable term. Similar remarks apply to the difference between $B$ and $V$.

Now let $N$ be the moon's mean motion referred to 1 as the unit of time, and $(N+\delta N)$ the moon's mean motion referred to $(1+x)$ as the unit of time,

then $(N+\delta N)\ (1+x) = N$,

$$\begin{aligned} \text{and } t\delta N &= \frac{N}{n}\left\{ 0{\cdot}055871\,.\,t - 0{\cdot}0000114955\,.\,t^2 \right\} \\ &= 0''{\cdot}747\,.\,t - 1''{\cdot}54\left(\frac{t}{100}\right)^2. \end{aligned}$$

But Hansen determined his mean motion of the moon so as to force an agreement between his theory and observations reduced with Bessel's unit 1; and his tables, therefore, represented the observations well for many years, whilst 1 was adopted as the unit of time; but directly the unit of time was changed by the adoption either of $H$ or $V$, then the effects of the erroneous determination of the moon's mean motion by Hansen became apparent. The change of error in longitude of Hansen's Lunar Tables between 1864, when Le Verrier's Solar Tables were adopted in the *Nautical Almanac*, and 1880, amounts to more than 10″.

The effect of the change of unit is also shown in the comparison of Le Verrier's Solar Tables with observation, but of course only to about the thirteenth part of the amount shown by the Lunar Tables. The necessity of adopting some definite unit of time by fixing the constants in the expression for the longitude of the mean sun is insisted upon.]

If $L_0 + n_0t + S_0t^2$ is the expression adopted for the longitude of the mean sun, the quantities $L_0$, $n_0$, $S_0$, must never be changed. The correction $\delta L$, which from time to time may appear necessary to obtain the mean longitude of the sun from the longitude of the mean sun must not be allowed to change the adopted values of $L_0$, $n_0$, and $S_0$. The true longitude of the sun will then

$$= L_0 + n_0t + S_0t^2 + \delta L + \text{periodic terms.}$$

It would appear that speculations respecting changes in the time of rotation of the earth on its axis are at least premature until the theories have been revised with a unit of time freed from changes of adopted constants which are at present inextricably mixed up with any effects which would result from a change in the time of rotation of the earth on its axis.

The longitude of the mean sun when properly investigated, differs from the mean longitude of the sun by a secular term—

$$0''{\cdot}3113\left(\frac{t}{100}\right)^2.$$

As this difference has been usually neglected in the determination of the sidereal time at mean moon, an error of about

$$13 \times 0''{\cdot}3113\,.\left(\frac{t}{100}\right)^2, \text{ or } 4''\left(\frac{t}{100}\right)^2$$

has been thrown upon this secular acceleration of the moon's mean motion. This accounts for the difference between Adam's theoretical value, and that deduced from eclipse observations.

**Chemical Society**, May 3.—Dr. W. H. Perkin, president, in the chair.—The following papers were read:—On a new oxide of tellurium, by Dr. E. Divers and M. Shimosé. When the compound of sulphur trioxide and tellurium, discovered almost simultaneously by the authors and by Weber, is treated in a vacuum, sulphur dioxide is evolved and a new oxide of tellurium is formed containing one atom of tellurium to one atom of oxygen. The decomposition takes place between 180° and 230°. The oxide is black, and quite stable at ordinary temperatures in dry air. No compound of this monoxide has yet been prepared, but in its properties it is essentially different from a mixture of tellurium and dioxide.—On tellurium sulphoxide, by Dr. Divers and M. Shimosé. The authors prepared this compound by pouring sulphur trioxide on to tellurium finely powdered and dried. It was purified from sulphur trioxide by heating to 35° and exhausting with the Sprengel pump. It is a red amorphous solid, quite stable at ordinary temperatures in sealed tubes. When heated in a vacuum to 90° it is changed into a bright fawn-coloured modification.—On a new reaction of tellurium compounds, by Dr. Divers and M. Shimosé. When sulphuric acid containing a small quantity of tellurium dioxide or sulphate in solution is poured into a hydrogen-generating apparatus, and the escaping hydrogen passed through a second portion of the telluretted sulphuric acid, a beautiful red colour, due to tellurium sulphoxide, is rapidly developed.—On a simple modification of the ordinary method for effecting the combustion of volatile liquids in Glaser's furnace with the open tube, by Watson Smith. The author causes the end of the combustion tube to project from the furnace, and volatilises the liquid by gently warming the current of gas with a Bunsen burner.—On the production of ammonia from the nitrogen of minerals, by G. Beilby. The author gives the results obtained with typical oil and coal shales when distilled (1) at a low red heat, (2) at a low red heat in a current of steam, (3) at a low red heat in a current of steam, the residual coke being afterwards subjected to the prolonged action of steam, so that a large portion of the coke is consumed and the nitrogen in it liberated as ammonia. Thus a sample of oil shale furnished by (1) 2·7 lbs. of nitrogen per ton as ammonia, by (2) 3·9 lbs., by (3) 12·0 lbs.—On the specific gravity of paraffin wax, solid, liquid, and in solution, by G. Beilby.

**Zoological Society**, May 1.—Prof. W. H. Flower, F.R.S., president, in the chair.—The Secretary read an extract from a letter addressed to him by Mr. W. L. Crowther, C.M.Z.S., respecting the possibility of obtaining living specimens of the Thylacine of Tasmania.—The Secretary exhibited, on behalf of Mr. H. Whitely, the skin of a Bird of Paradise (*Diphyllodes gulielmi*) from the Island of Waigiou, which was believed to be the second example of this rare species yet obtained.—The Secretary exhibited a set of Radde's international colour-scales, and explained the way in which it was intended to be used.—A

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communication was read from Mr. F. Moore, F.Z.S., containing the second part of a monograph of the sections *Limnaina* and *Euplœina*, two groups of Diurnal Lepidoptera belonging to the subfamily *Euplœinæ*. The present paper contained the descriptions of many new genera and species belonging to the group *Euplœina*.—Mr. Alfred Tylor, F.Z.S., read a paper on the colouration of animals, showing that the character of the ornament or decoration differs in the two great divisions of the animal kingdom—the Invertebrata and Vertebrata. Mr. Tylor pointed out that the law of emphasis, well known in architecture, was, in his opinion, applicable to natural history, and showed that the prominent characters of the animal are picked out in colour in precisely the same manner whenever colour is present. He divided his subject into several sections, and exhibited illustrations of the more important families in coloured diagrams.—A communication was read from Dr. O. Boettger, of Frankfort-on-the-Main, containing the description of new species of land-shells of the genus *Clausilia* from the Levant, collected by Vice-Admiral Spratt, F.R.S.—Mr. W. F. Kirby gave an account of a small collection of Hymenopterous and Dipterous insects obtained in the Timor-Laut group of islands by Mr. H. O. Forbes.

**Mathematical Society**, May 10.—S. Roberts, F.R.S., vice-president, in the chair.—Prof. M. J. M. Hill, of the Mason College, Birmingham, was elected a member.—Prof. Cayley made a communication on Mr. Wilkinson's rectangular transformation.—Mr. Tucker read abstracts of papers by Prof. Genese, relations between the common points and common tangents of two conics; by Mr. W. R. W. Roberts, on the motion of a particle on the surface of an ellipsoid; and by Mr. R. A. Roberts, on unicursal twisted quartics, part ii.; he also made a communication on two concentric circles. The circles considered were a circle which the author proposes to call the "Triplicate-Ratio" (T.R.) circle and Brocard's circle. If through a point ($P$) within a triangle $ABC$ (whose trilinear coordinates are $2a\Delta/\kappa$, $2b\Delta/\kappa$, $2c\Delta/\kappa$, where $\kappa$ stands for $a^2+b^2+c^2$), straight lines $DPE^1$, $EPF^1$, $FPD^1$ be drawn, then the circle $DD^1EE^1FF^1$ is the T.R. circle. The origin of the name is due to the fact that the intercepts on the sides ($DD^1$, $EE^1$, $FF^1$) are equal to $a^3/\kappa$, $b^3/\kappa$, $c^3/\kappa$ respectively If $\lambda^2=a^2b^2+b^2c^2+c^2a^2$ and $\mu=\lambda/\kappa$, then the triangles $DEF$, $D^1E^1F^1$, which are equal to one another, and are similar to $ABC$, have their sides $=\mu a$, $\mu b$, $\mu c$. The lengths $D^1E$, $E^1F$, $F^1D$ are equal to $abc/\kappa$, so that the perimeter of the above-named hexagon is $(a^3+b^3+c^3+3abc)/\kappa$. Other curious properties were pointed out. If the angle $BFD$ be denoted by $\omega$, then $\cot\omega=\cot A+\cot B+\cot C$, and several other trigonometrical relations were indicated. If through $A$, $B$, $C$ lines are drawn parallel to the sides of $DEF$, $D^1E^1F^1$, these by their intersections determine five of the points on Brocard's circle, the other two Brocard points being $P$ and $H$ (the centre of the circum-circle). Lastly the trilinear equations to the two circles were given, and it was shown that the two circles are concentric. The T.R. circle also divides each side into segments which are in the duplicate ratios of the sides.—The Rev. M. M. U. Wilkinson read a second paper on spherical functions.

**Geological Society**, April 25.—Mr. J. W. Hulke, F.R.S., president, in the chair.—Rev. William Franklen Evans, Ernest Hall Hedley, and Henry James Plowright were elected Fellows, and Dr. J. S. Newberry, of New York, a Foreign Member of the Society.—The following communications were read:—On the skull of *Megalosaurus*, by Prof. R. Owen, C.B., F.R.S. The specimens described in this communication were obtained by Edward Cleminshaw from the freestone of the Inferior Oolite near Sherborne (Dorset) from some blocks which had been quarried for building purposes. These were sent by him to the British Museum, where the remains have been developed. One block includes a great proportion of the right side of the facial part of the skull, the missing parts being the fore-end of the premaxillary, the suborbital end of the maxillary, and the upper hinder pointed termination of the same bone. Ten teeth are preserved in the maxillary bone. Another block contains the outer side of the right mandibular ramus with teeth and with some other fragments. In a third block is the anterior part of the left mandibular ramus with portions of the teeth. These remains were described in detail; and in conclusion the author discussed the bearing of these and other Megalosaurian remains upon our knowledge of the structure of that animal and its affinity to existing Reptilia, and criticised some of the evidence on which the relationship of the Dinosauria to birds is inferred, a relationship which he had suggested in 1841, but upon grounds which appeared to him to be more satisfactory.—Notes on the Bagshot sands, by Mr. H. W. Monckton, F.G.S.—Additional note on boulders of hornblende picrite near the western coast of Anglesey, by Prof. T. G. Bonney, F.R.S.

**Institution of Civil Engineers**, April 8.—Mr. Brunlees, president, in the chair.—The paper read was "On the Diamond Fields and Mines of South Africa."

### EDINBURGH

**Mathematical Society**, May 11.—Mr. J. S. Mackay, F.R.S.E., president, in the chair.—Mr. D. Munn, F.R.S.E., gave an address on the geometry of the nine-point circle, and Dr. C. G. Knott, F.R.S.E., a paper on Newton's "Opticks."

### BERLIN

**Physical Society**, April 30.—Dr. Pringsheim reported on his recently published measurements of the wave-lengths of the least refractive rays of the solar spectrum. In order to obtain them he used a radiometric torsion apparatus, similar to those used by Crookes, which carried a small mirror by which the revolution of the torsion-beam caused by the ray could be observed. The source of light were solar rays reflected into a dark room by a heliostat, first united in a focus by a concave mirror, then rendered parallel and directed upon a revolvable grating-mirror, which produced a whole series of spectra. The various divisions of the first spectrum were directed upon the torsion-apparatus by means of a slit, and it was noted up to what wave-length the mirror still performed part of a revolution. In order to exclude the visible rays of the second spectrum which were mixed with the infra-red ones of the first spectrum, and prevent their reaching the torsion-apparatus, Dr. Pringsheim cut them off partly by an iodine solution, partly by an ebonite plate according to Abney. The extreme limit of the spectrum where an effect was still observed was at the wave-length $\lambda=0{\cdot}00152$mm.—Prof. Neesen reported upon a treatise entitled "On the Contractions of Volume as a Measure of Chemical Affinities," sent to the Society for publication in its *Transactions* by Herr Müller Erzbach of Bremen. He shows in a number of salts formed by selenic and chromic acids that in chemical combination a stronger contraction of volume corresponds to a greater chemical affinity, and is shown in the heat generated when the combination takes place; while in those salts which show a smaller contraction, acid and base are bound together by less powerful affinity.

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